

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 2004P08677WOP72CF	<b>FOR FURTHER ACTION</b> <div style="text-align: right;">See Form PCT/PEA/416</div>	
International application No. PCT/EP2005/005154	International filing date ( <i>day/month/year</i> ) 12.05.2005	Priority date ( <i>day/month/year</i> ) 25.05.2004
International Patent Classification (IPC) or national classification and IPC INV. F17C13/00 H01F6/00		
Applicant SIEMENS MAGNET TECHNOLOGY LTD. et al.		
1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of 4 sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. <input checked="" type="checkbox"/> <i>sent to the applicant and to the International Bureau</i> a total of 2 sheets, as follows: <input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box. b. <input type="checkbox"/> <i>(sent to the International Bureau only)</i> a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).		
4. This report contains indications relating to the following items: <div style="margin-left: 20px;"> <input checked="" type="checkbox"/> Box No. I      Basis of the report  <input type="checkbox"/> Box No. II     Priority  <input type="checkbox"/> Box No. III    Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  <input type="checkbox"/> Box No. IV    Lack of unity of invention  <input checked="" type="checkbox"/> Box No. V     Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement  <input type="checkbox"/> Box No. VI    Certain documents cited  <input type="checkbox"/> Box No. VII    Certain defects in the international application  <input type="checkbox"/> Box No. VIII   Certain observations on the international application         </div>		
Date of submission of the demand  24.03.2006	Date of completion of this report  08.06.2006	
Name and mailing address of the international preliminary examining authority:  <div style="display: flex; align-items: center;"> <div>             European Patent Office              D-80298 Munich              Tel. +49 89 2399 - 0 Tx: 523656 epmu d              Fax: +49 89 2399 - 4465           </div> </div>	Authorized officer  Nicol, B  Telephone No. +49 89 2399-8188 <div style="text-align: right;"> </div>	

INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITYInternational application No.  
PCT/EP2005/005154

10/594618

**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on
- ☒ the international application in the language in which it was filed
  - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of:
    - ☐ international search (under Rules 12.3(a) and 23.1(b))
    - ☐ publication of the international application (under Rule 12.4(a))
    - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

**Description, Pages**

1-7 as originally filed

**Claims, Numbers**

1-10 received on 24.03.2006 with letter of 21.03.2006

**Drawings, Sheets**

1/2, 2/2 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/EP2005/005154

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	
	No: Claims	1-10
Inventive step (IS)	Yes: Claims	
	No: Claims	1-10
Industrial applicability (IA)	Yes: Claims	1-10
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.

PCT/EP2005/005154

**10/594618****Re Item V**

1. Although claims 1, 6, 7, 8, 10 have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought or in respect of the terminology used for the features of that subject-matter. **The aforementioned claims therefore lack conciseness and as such do not meet the requirements of Article 6 PCT.**

**2. The present application does not meet the requirements of Article 33(1) PCT, because the subject-matter of independent claim 1 is not new in the sense of Article 33(1) and (2) PCT.**

Document D1 discloses in accordance with claim 1 (see fig. 4) a cooling apparatus (Fig.4) comprising a removable cryogenic refrigerator (pulse tube refrigerator comprising cooling stages 31,33) and a thermal interface between the removable cryogenic refrigerator and an article (gas part of the helium bath 18) to be cooled by the cryogenic refrigerator, wherein the thermal interface consists of a gas (helium atmosphere with induced convection current 72) held in thermal contact with a cooling surface (31 or 33) of the refrigerator, within a closed (chamber with helium atmosphere with induced convection current 72) recondensing chamber, and the article is cooled by thermal conduction through a wall (33, 26) of the recondensing chamber.

Thus, a system comprising all the features of claim 1 is known from D1.

**3. The subject-matter of claims 2 - 9 is also not new (Article 33 (2) PCT) or does not involve an inventive activity in the sense of Article 33(3) PCT, since the additional features of some of these claims are also shown in D1, or because the slight constructional changes of the subject-matter of some of these claims come within the scope of the customary practice followed by the person skilled in the art, or according to a similar reasoning as given for claim 1.**

4. Claim 10 contains references to the description or the drawings. According to Rule 6.2(a) PCT, claims should not contain such references except where absolutely necessary, which is not the case here.

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## CLAIMS

1. Cooling apparatus comprising a removable cryogenic refrigerator (4) and a thermal interface between the removable cryogenic refrigerator (4) and an article to be cooled by  
5 the cryogenic refrigerator, wherein the thermal interface consists of a gas held in thermal contact with a cooling surface (9) of the refrigerator, within a closed recondensing chamber (12), and the article (10) is cooled by thermal conduction through a wall (10) of the closed recondensing chamber.
- 10 2. Cooling apparatus according to claim 1 wherein the cryogenic refrigerator is mounted within a sleeve (5), and the volume within the sleeve surrounding the refrigerator forms the closed recondensing chamber.
3. Cooling apparatus according to any preceding claim, wherein the gas condenses to a  
15 liquid (12) on the cooling surface (9) and falls under gravity into contact with the wall (10) of the closed recondensing chamber.
4. Cooling apparatus according to any preceding claim wherein the wall (10) of the closed recondensing chamber is in thermal contact with a further recondensing chamber  
20 (11), arranged for the recondensation of a cryogen gas and sealed from the closed recondensing chamber of the interface.
5. Cooling apparatus according to any preceding claim wherein the cooling surface (9) is provided with fins.
- 25 6. A cryostat comprising a cryogen vessel (1) containing a liquefied cryogen (16), and comprising a recondenser (11a) exposed to the interior of the cryogen vessel (1), the recondenser being connected for cooling by cooling apparatus according to any of claims 1-5.
- 30 7. An MRI system comprising superconducting windings contained within a cryostat as claimed in claim 6.

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8. A thermal interface, comprising a closed recondensing chamber (5) around a recondensing refrigerator (4) and in thermal contact with a component to be cooled through a wall (10) of the closed recondensing chamber, the closed recondensing chamber being filled with a gas which is recondensed into a liquid (12) by the recondensing refrigerator 5 whereby thermal contact between the recondensing refrigerator and the component is provided by recondensation of the gas and through the wall of the closed recondensing chamber.

9. A method for recondensing a cryogen gas (16) within a cryostat (1) comprising the 10 steps of:

- providing a recondensing surface (11a) exposed to the cryogen gas within the cryostat and arranged in thermal contact with a wall of a closed recondensing chamber of a thermal interface as recited in claim 8; and
- cooling the recondensing surface by cooling the component through the wall of the closed 15 recondensing chamber of the thermal interface.

10. Apparatus substantially as described, and/or as illustrated in Fig. 2 of the accompanying drawing.